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Kaiser et al.

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(54) **ADJUSTABLE KNOTLESS LOOPS**

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(58) **Field of Classification Search**

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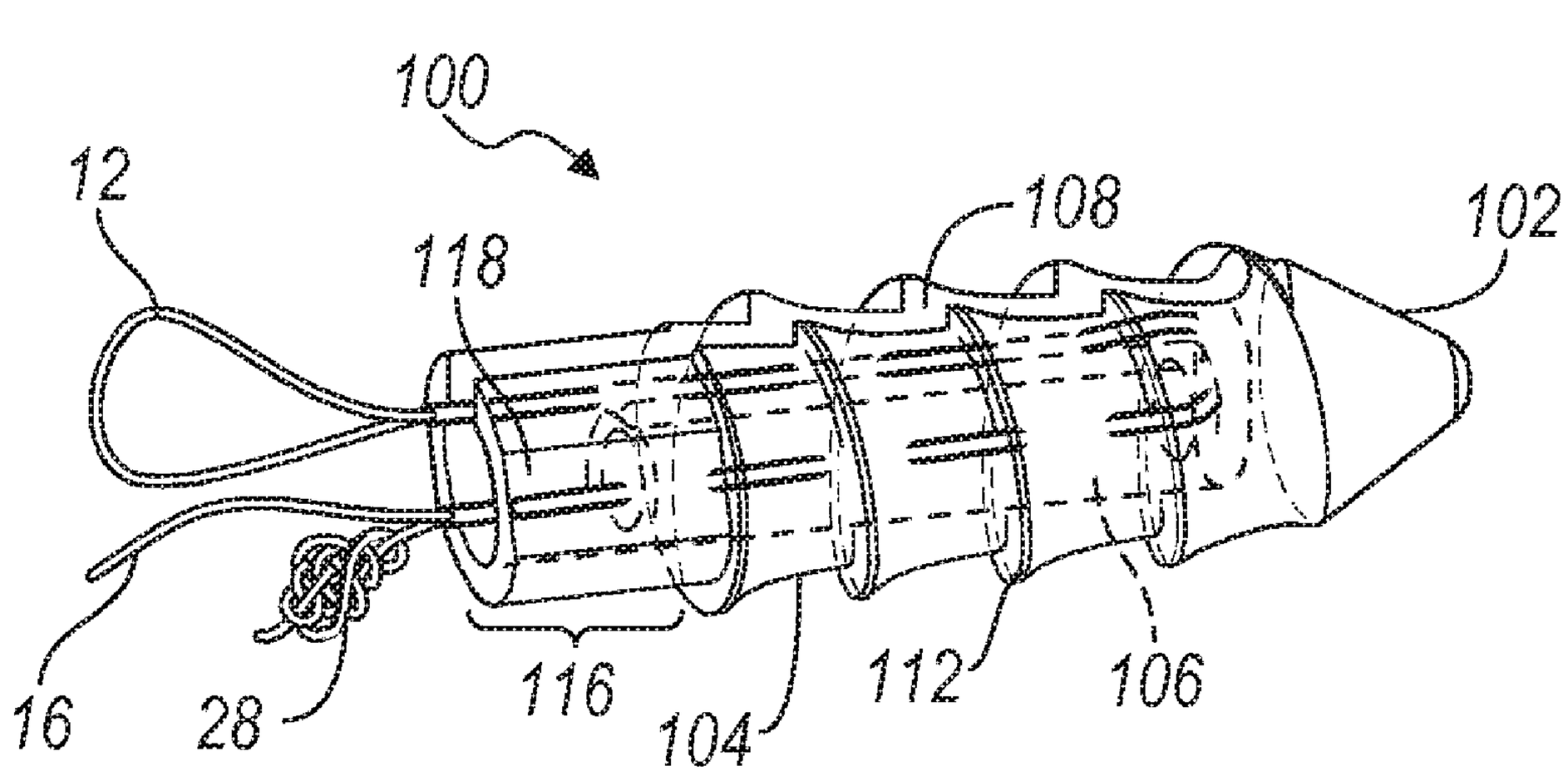
(57) **ABSTRACT**

Methods of attaching a soft tissue to an adjacent bone at a defect site are provided. An adjustable loop region of a flexible construct contained in a bore defined by a fastener is passed through a tissue. The adjustable loop is passed through the tissue. The fastener is passed back through the adjustable loop to fold the adjustable loop upon itself. The fastener is attached to the bone. An adjusting arm on the flexible construct is engaged to reduce the size of the adjustable loop and secure the soft tissue to the bone.

14 Claims, 8 Drawing Sheets



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See application file for complete search history.

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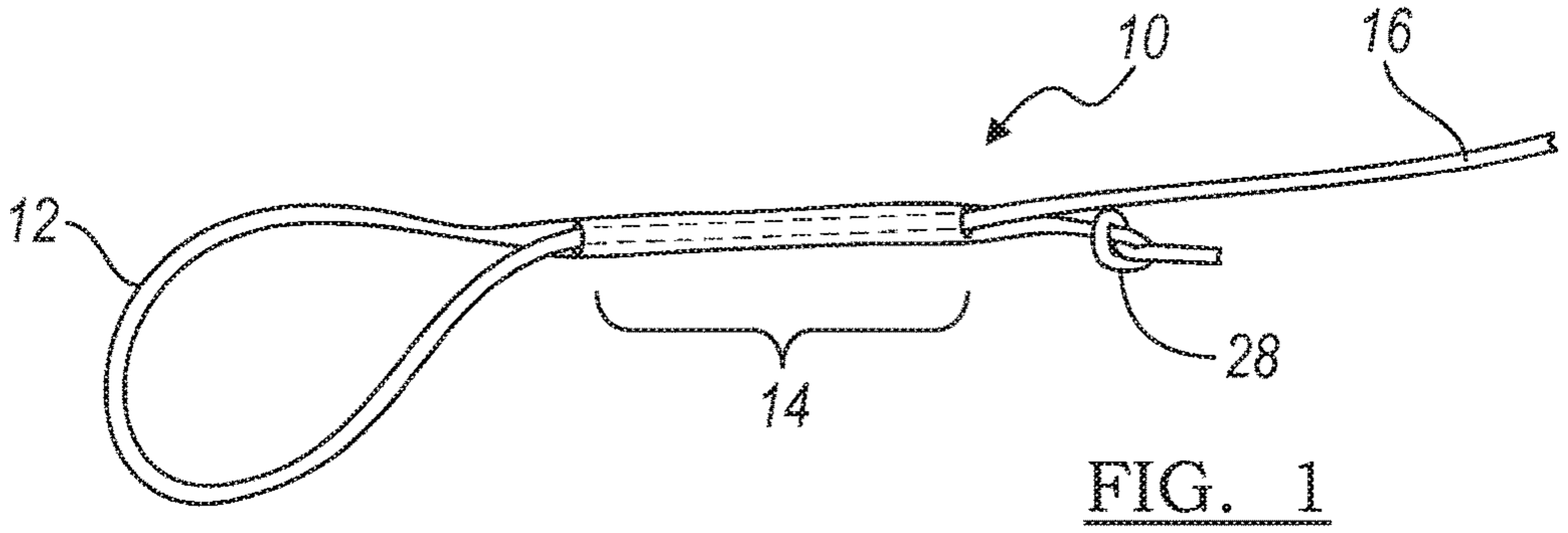

FIG. 1

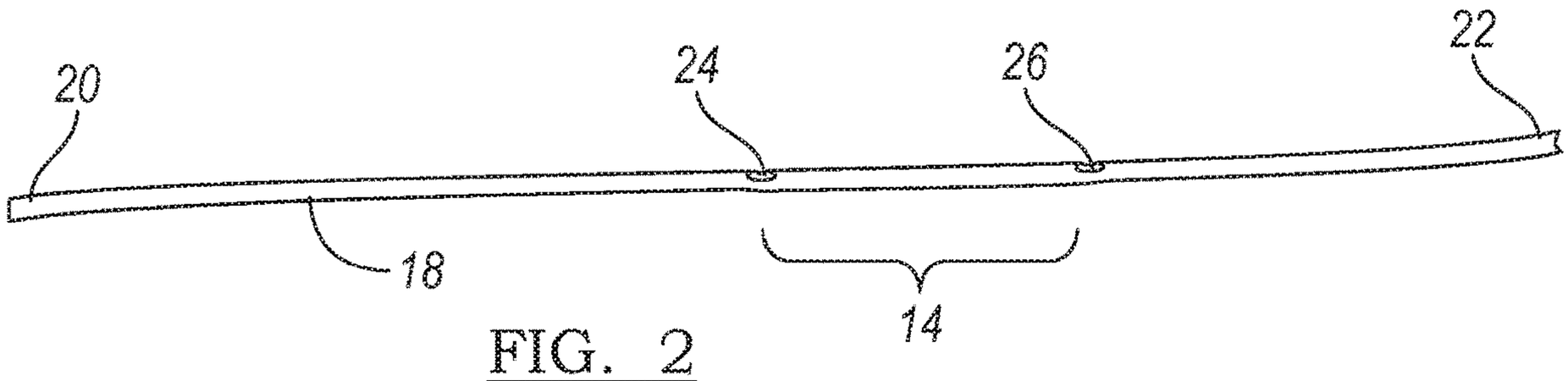

FIG. 2

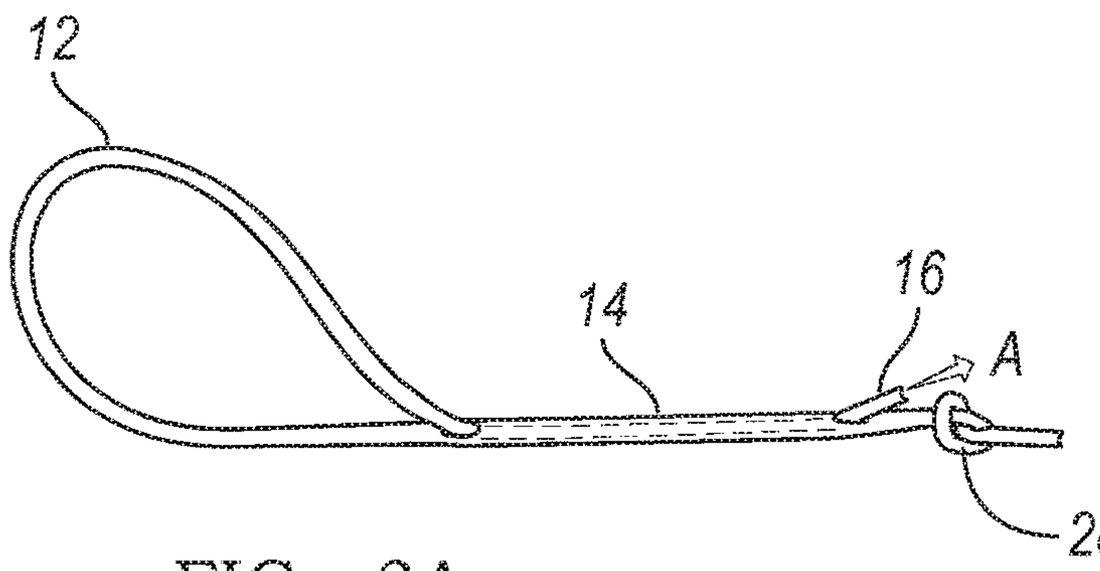

FIG. 3A

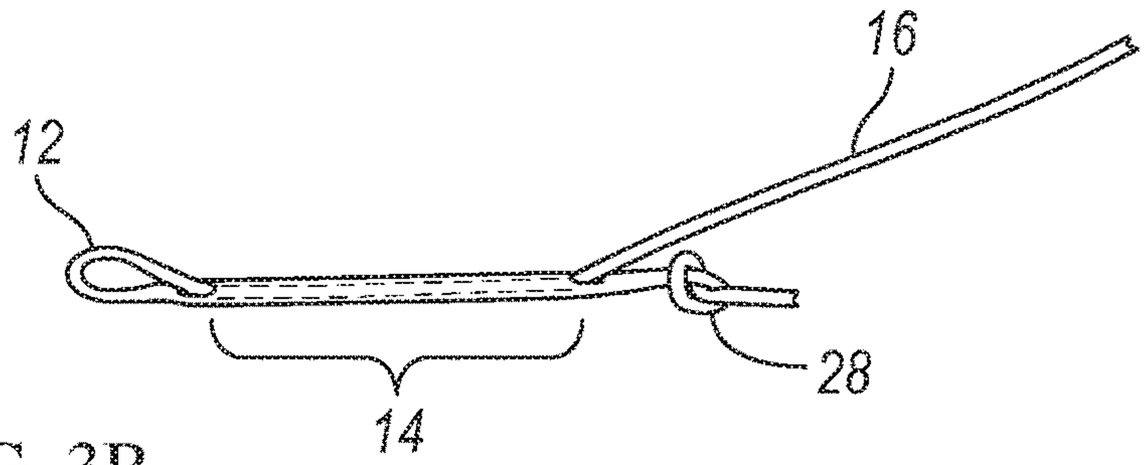

FIG. 3B

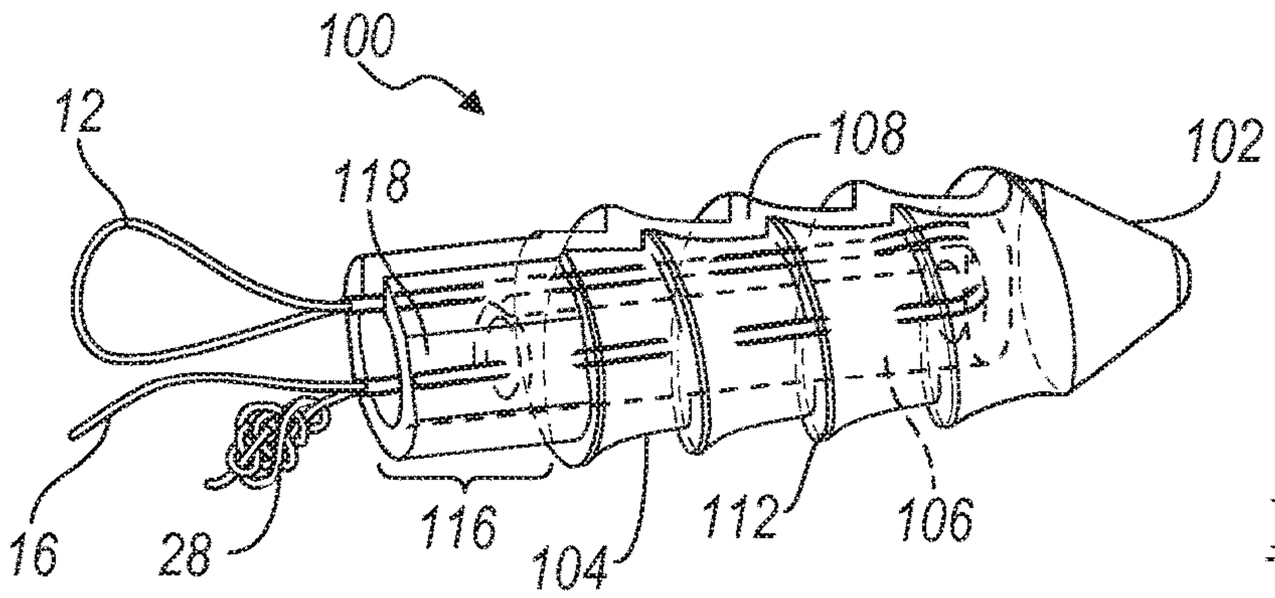

FIG. 4

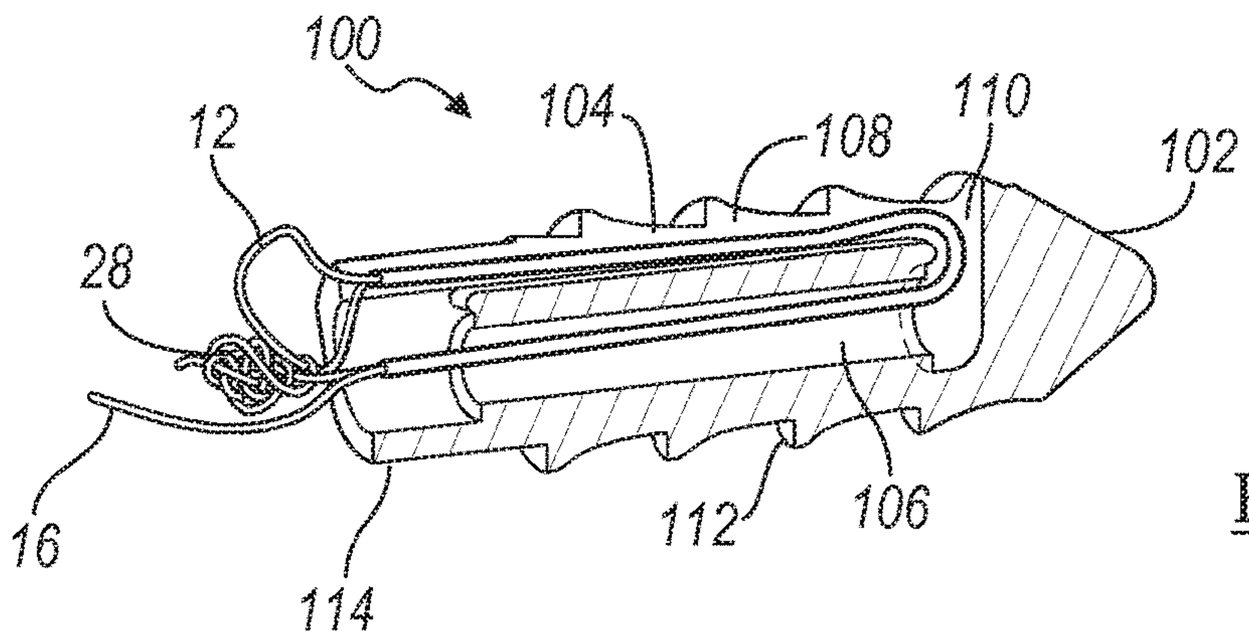

FIG. 5

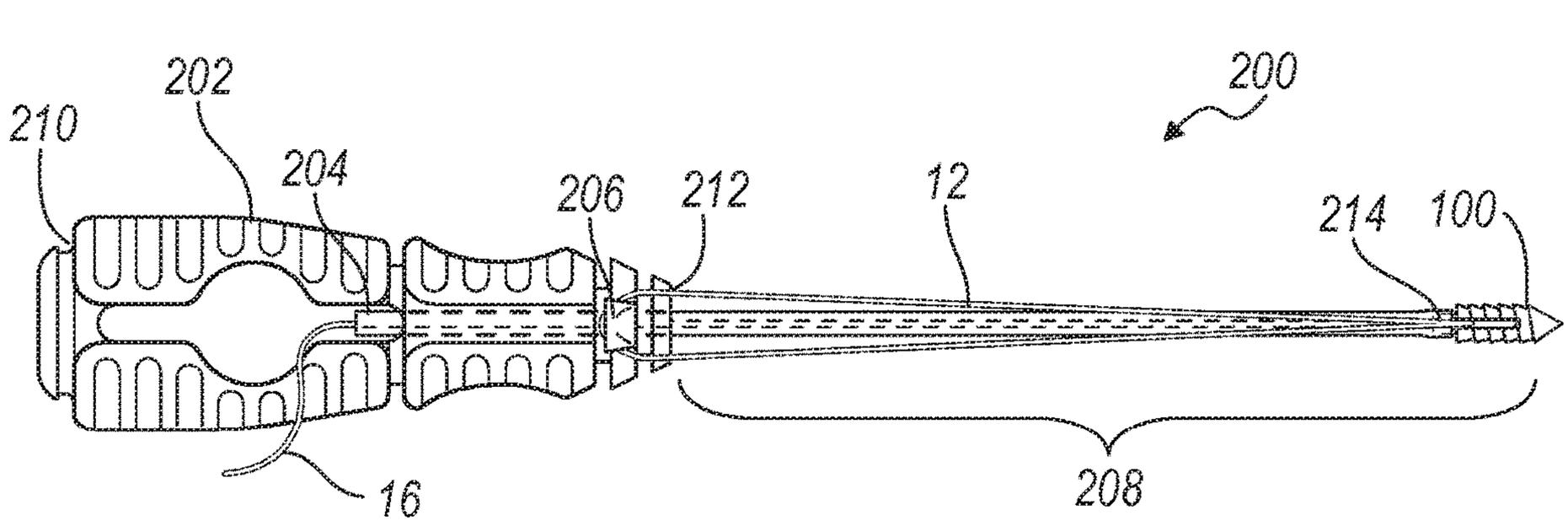

FIG. 6

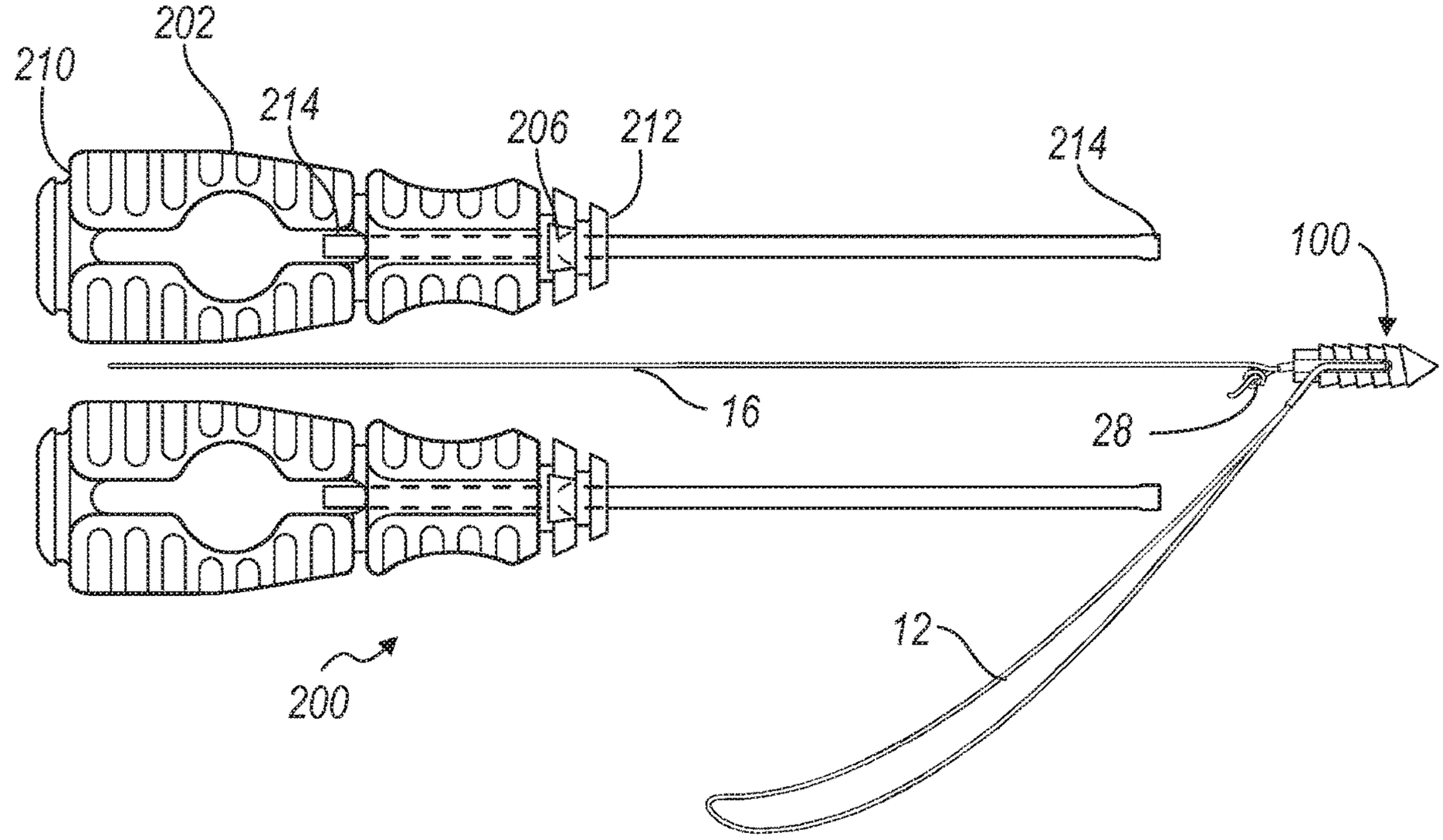

FIG. 7

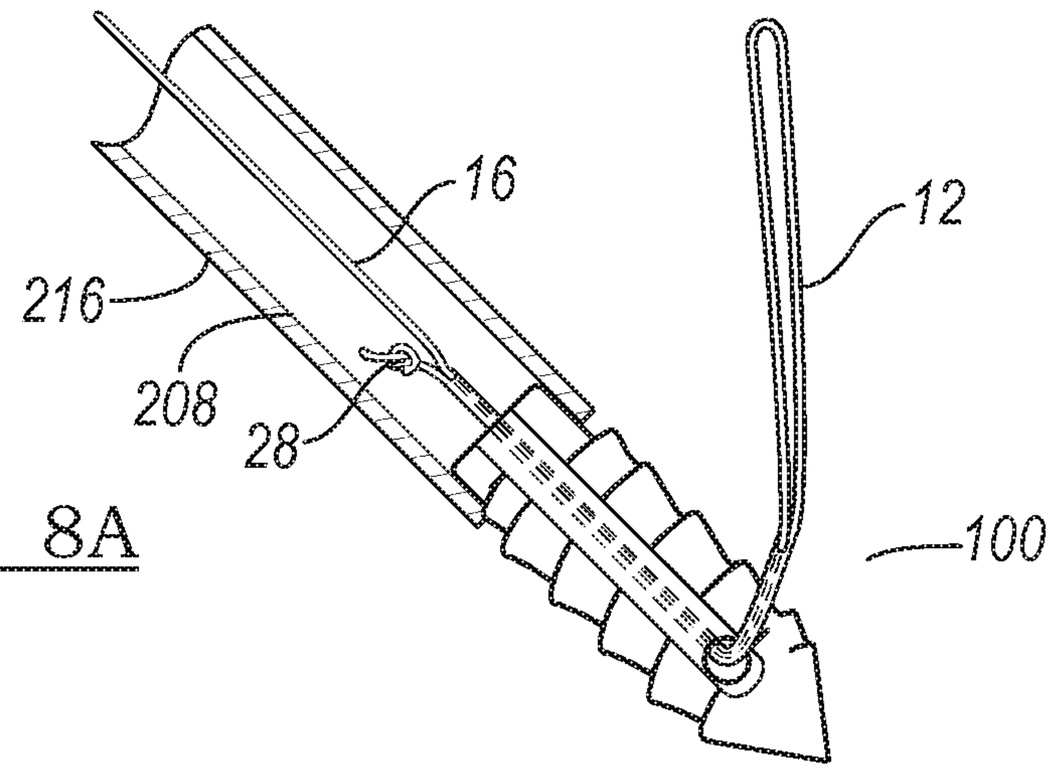

FIG. 8A

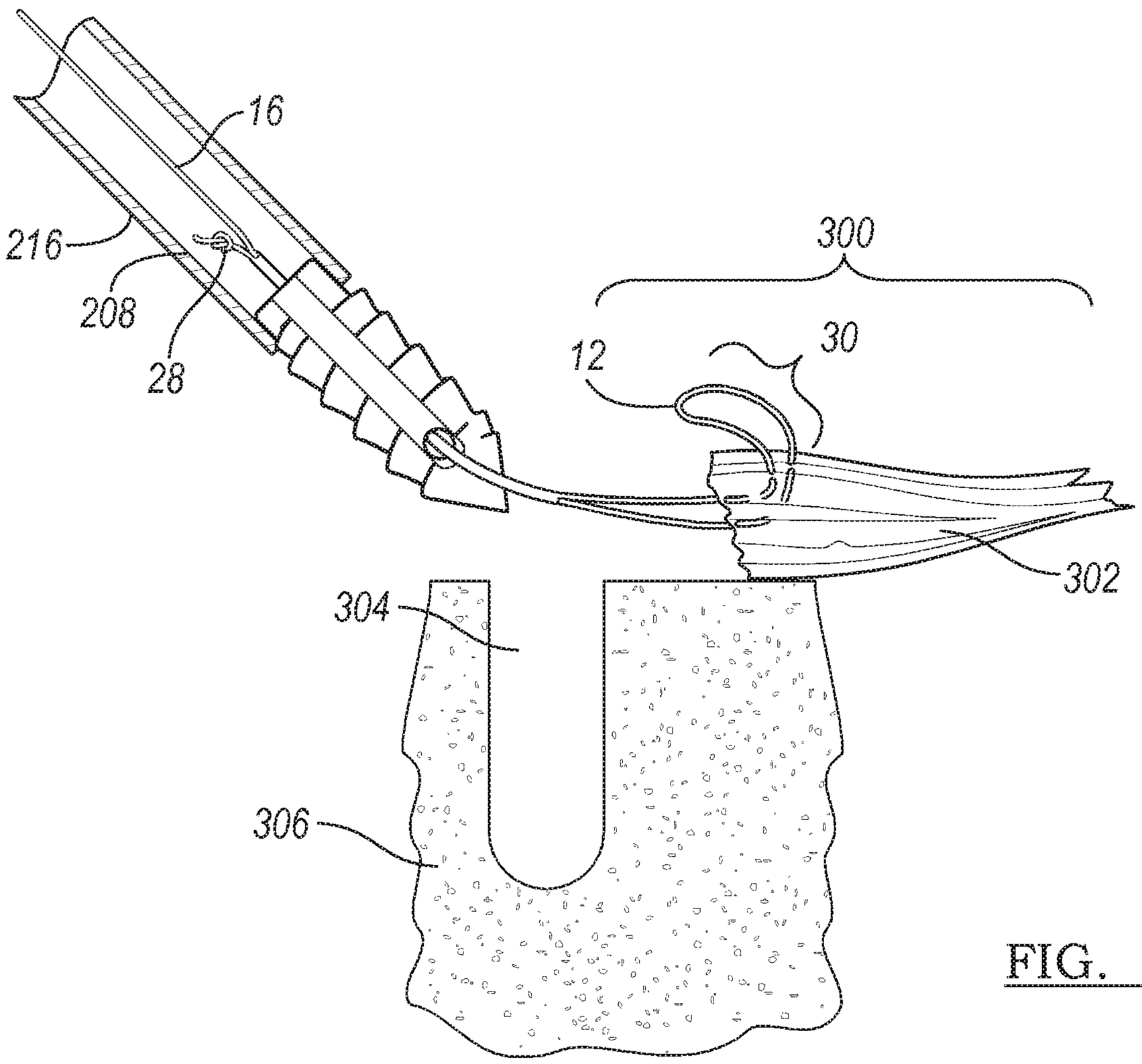

FIG. 8B

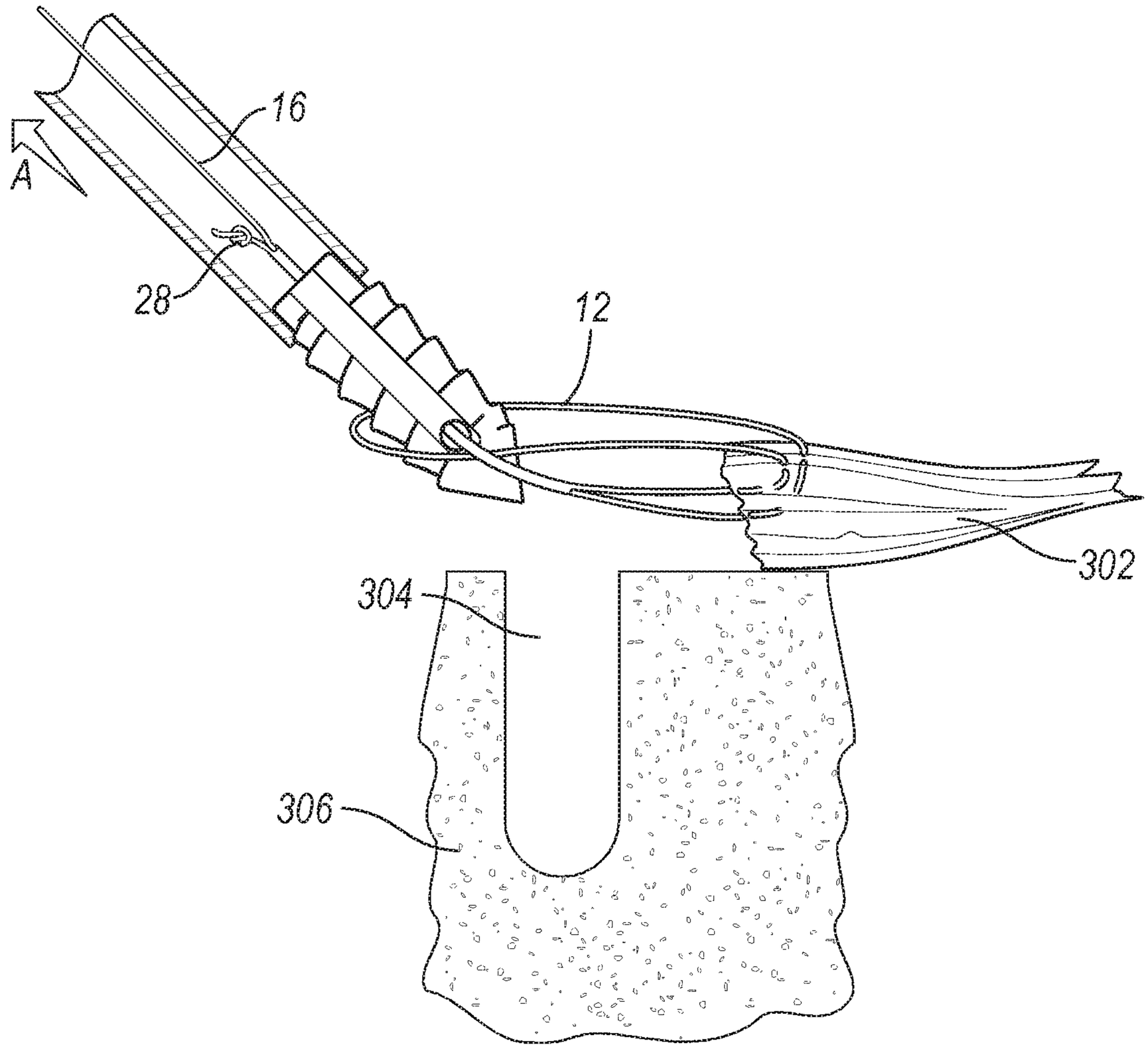

FIG. 8C

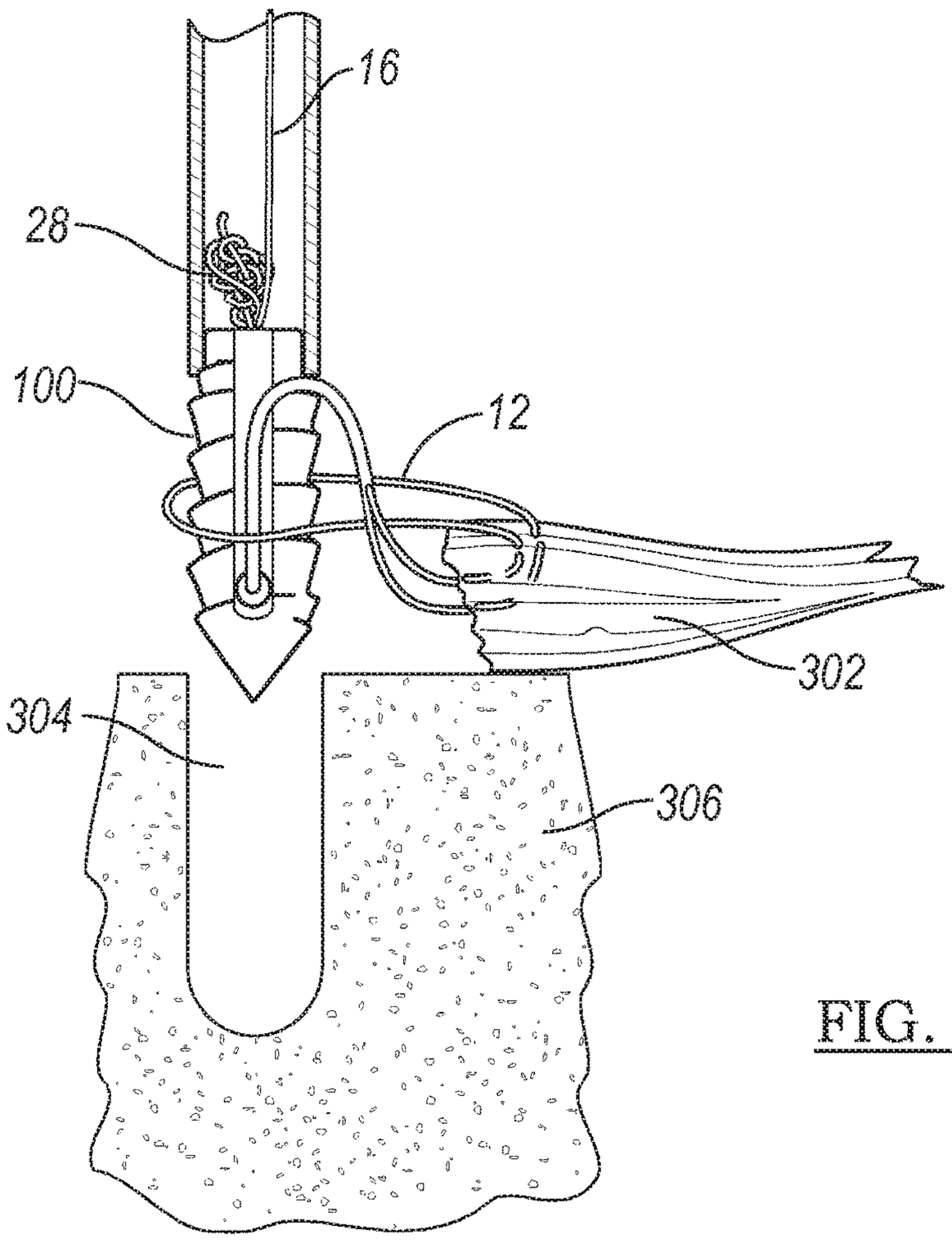

FIG. 8D

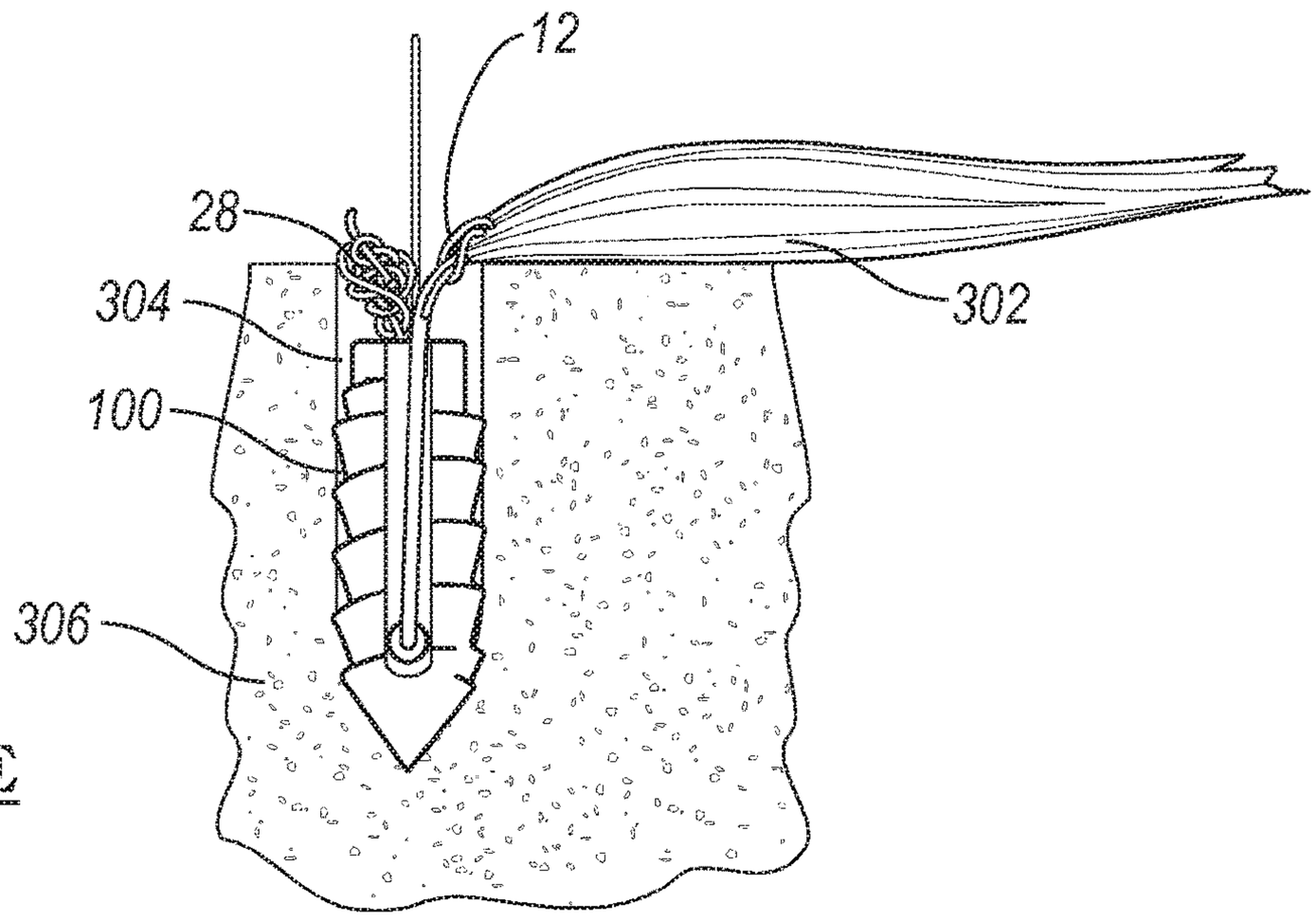

FIG. 8E

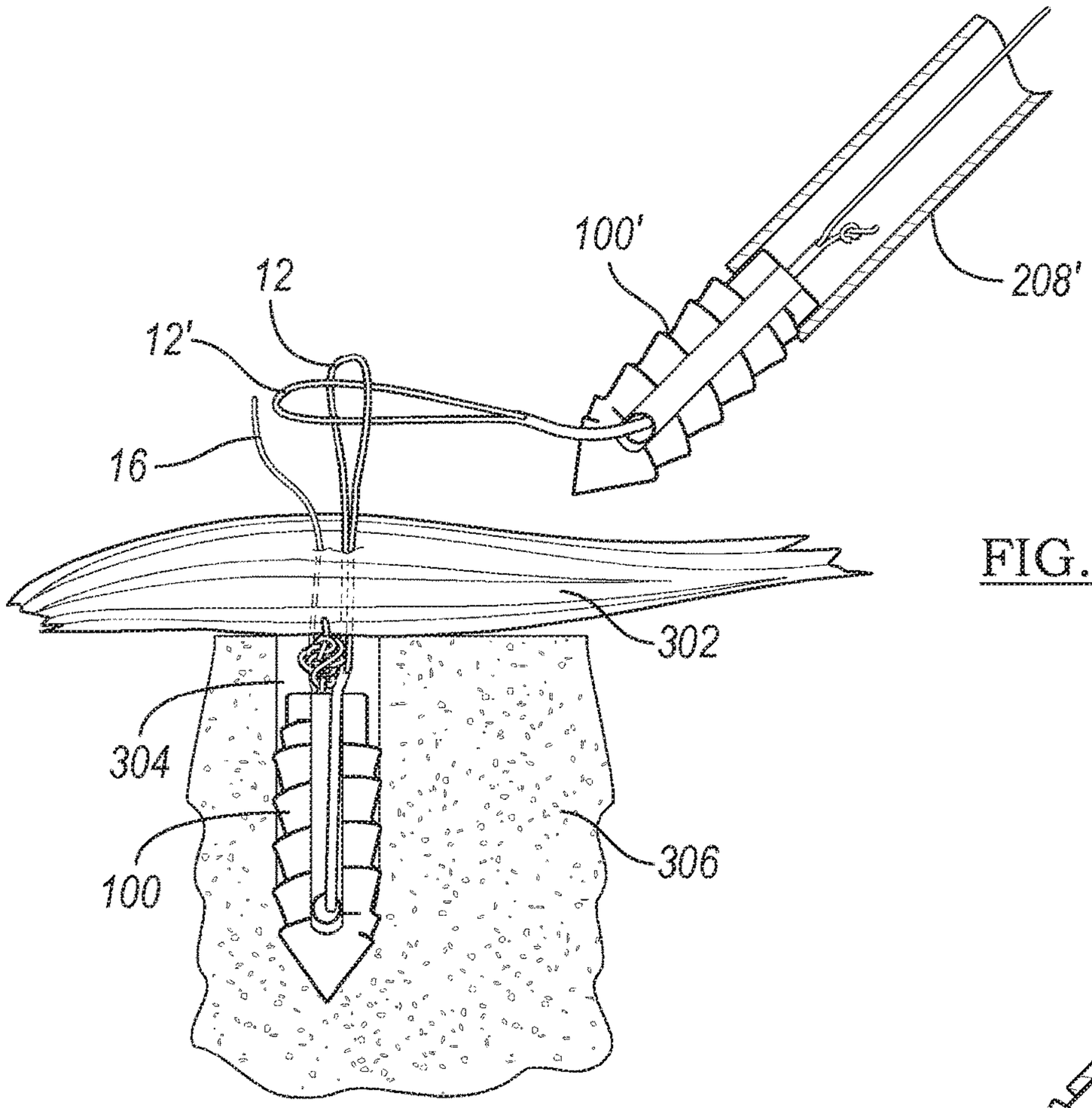

FIG. 9A

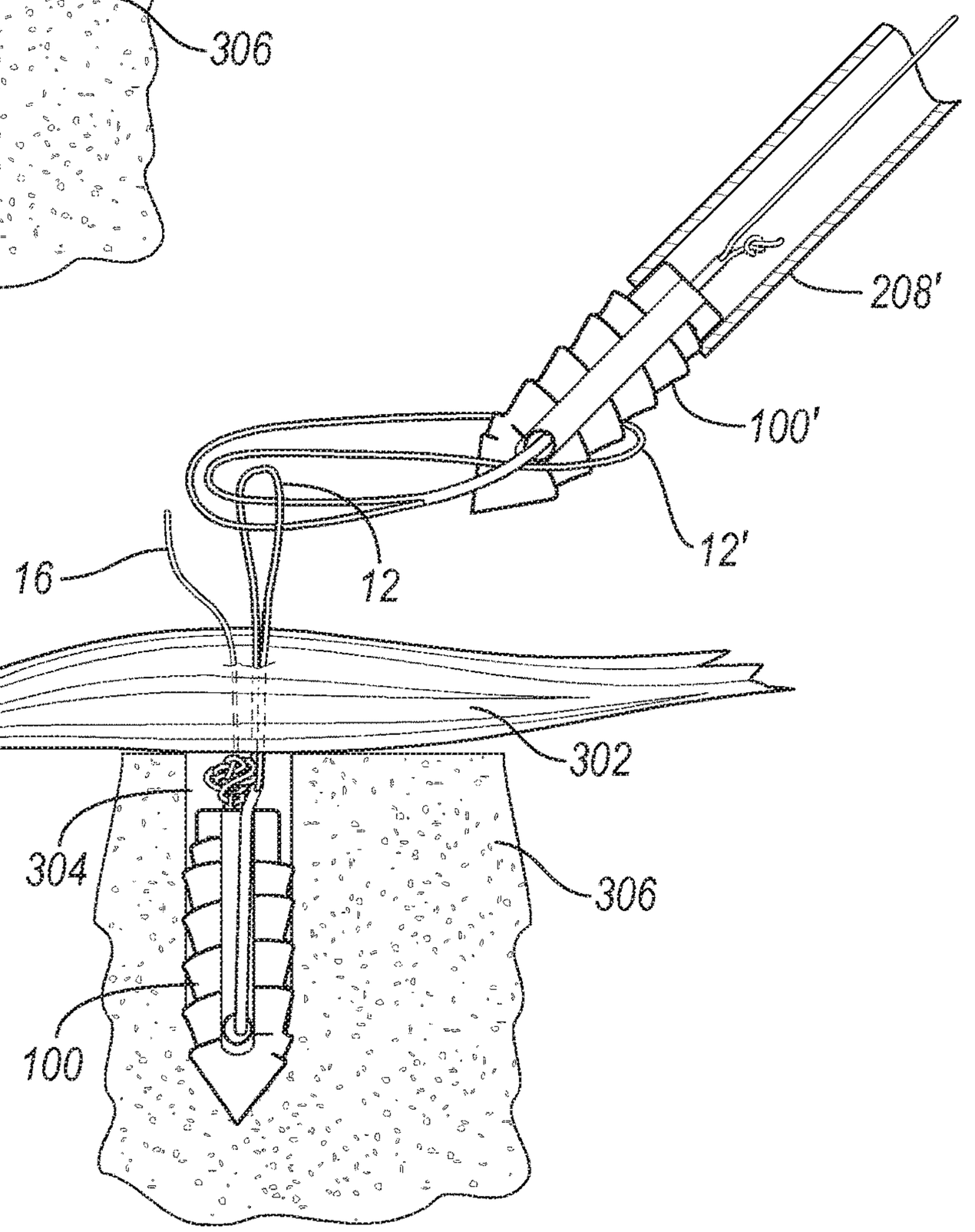

FIG. 9B

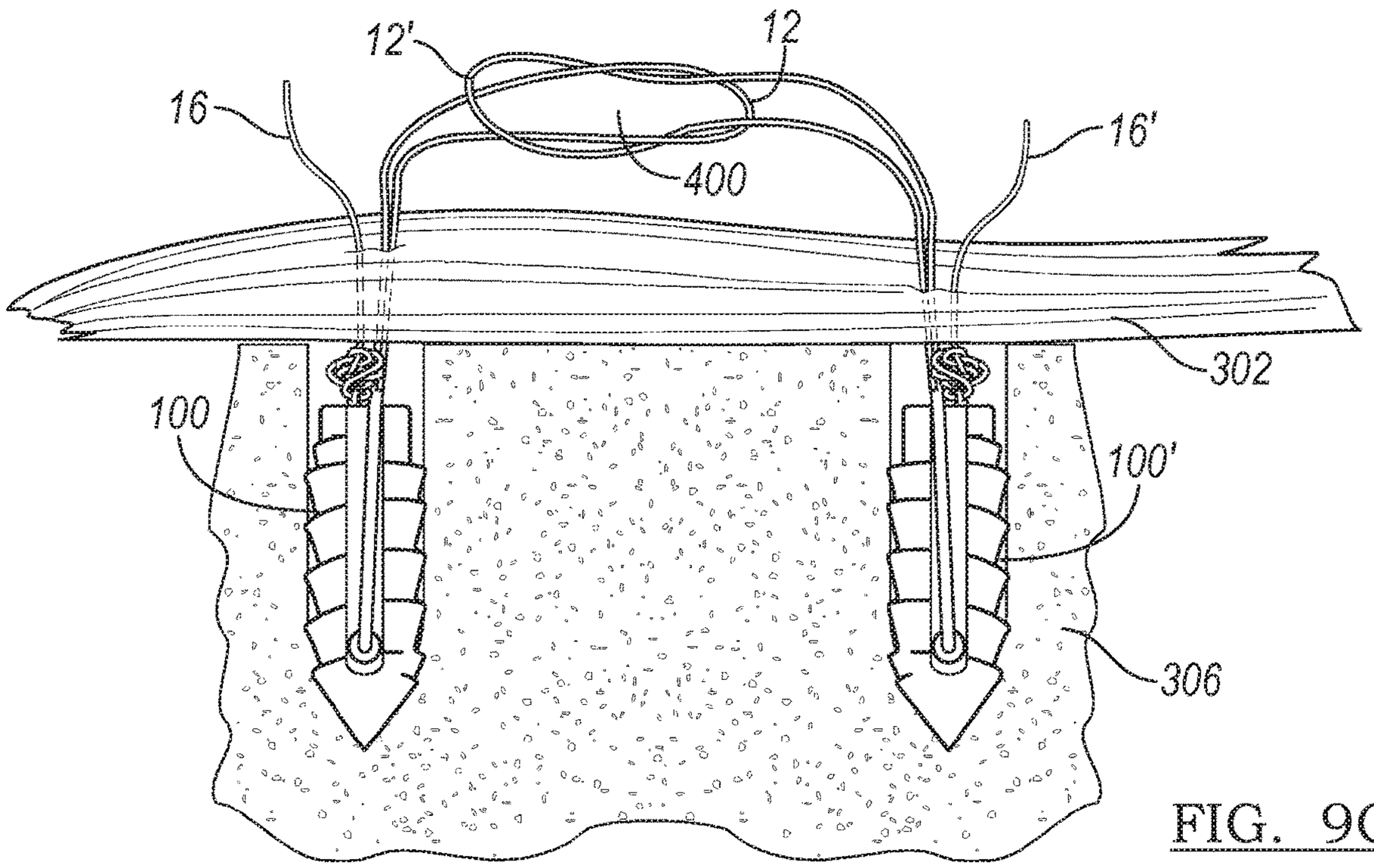

FIG. 9C

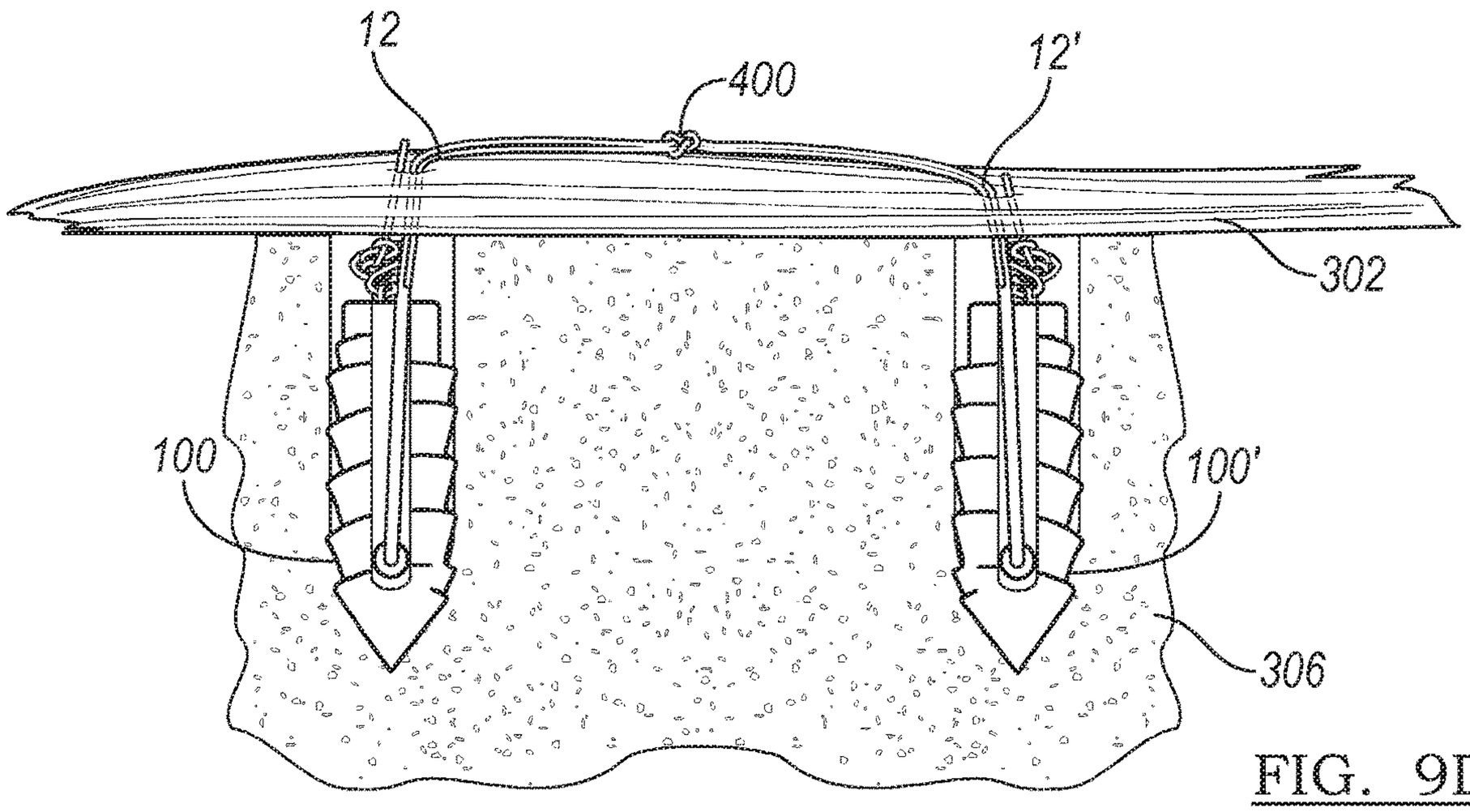

FIG. 9D

ADJUSTABLE KNOTLESS LOOPS

FIELD

The present disclosure relates to methods and apparatuses for securing a flexible construct. In particular, the present disclosure relates to securing a flexible construct with an adjustable loop.

BACKGROUND

The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

Surgical procedures are often performed on a body, for example, a human body or anatomy, to repair or replace various portions thereof. For example, the soft tissues of the body may need to be reattached to bones due to trauma, overuse, surgical intervention, or disease.

Soft tissues can be reattached to bone using fastening devices such as screws, staples, and various types of suture anchors. Soft tissues are often fixed to various positions on the bone. For example, to replace a natural tendon fixation point or to replace the tendon itself, fixing a graft to a selected bone area may be desired. One means to fix a soft tissue to the selected area is to provide a suture through a selected portion of the soft tissue and fix the other end of the suture to a selected area on the bone with the fastener. To secure the sutures, the free ends of the suture are tied together to form a knot.

The use of knots in surgical procedures, however, can be improved upon. In minimally invasive procedures, such as arthroscopic or laparoscopic procedures, the surgical site is not readily accessible and limits the surgeon's ability to tie a knot manually. One remote method of securing the suture is tying each of the suture ends into a knot extracorporeally and then remotely advancing the knot into the surgical site using suitably configured instruments. Securing the suture remotely can be cumbersome and time-consuming.

Accordingly, there is a need for improved devices for securing a suture without a knot. There is a need for surgical methods to facilitate easy and efficient securing of the suture.

SUMMARY

The present teachings provide methods of attaching a soft tissue to an adjacent bone at a defect site. An adjustable loop of a flexible construct contained in a bore defined by a fastener is passed through the soft tissue. The fastener is passed back through the adjustable loop to fold the adjustable loop upon itself. The fastener is attached to the bone. An adjusting arm on the flexible construct is engaged to reduce the size of the adjustable loop and secure the soft tissue to the bone.

The present teachings also provide methods of repairing a cartilage defect. An adjustable loop of a flexible construct is offset through a bore defined by a fastener. The adjustable loop is secured to a proximal end of the fastener with a restriction element. The adjustable loop is passed through the cartilage. The fastener is passed back through the adjustable loop to fold the adjustable loop upon itself. The fastener is fixed to an area adjacent the cartilage defect such that the adjustable loop and a proximal end of the fastener abut the cartilage defect. An adjusting arm on the flexible construct is engaged to reduce the size of the adjustable loop and secure the soft tissue to the bone.

The present teachings further provide methods of attaching a soft tissue to an adjacent bone at a defect site. An adjustable loop of a first flexible construct contained in a bore defined by a first fastener is passed through a tissue. The first fastener is then attached to the bone. A second fastener having a second adjustable loop of a second flexible construct passed through a bore therein is passed through the first adjustable loop on the first fastener. The second fastener is passed back through the first adjustable loop to interlace the first adjustable loop and the second adjustable loop.

Further areas of applicability will become apparent from the description provided herein. It should be understood that the description and specific examples are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

FIG. **1** depicts a flexible construct according to various embodiments;

FIG. **2** depicts a fully extended flexible construct according to various embodiments;

FIGS. **3**A and **3**B depict movement of the adjustable loop according to various embodiments;

FIG. **4** depicts an assembly of an adjustable loop disposed about a suture anchor according to various embodiments;

FIG. **5** depicts a cross-section of the assembly of FIG. **4**;

FIG. **6** depicts the adjustable loop disposed about a suture anchor and attached to a driver according to various embodiments;

FIG. **7** depicts an exploded view of the assembly of FIG. **6**;

FIGS. **8**A through **8**E depict a surgical technique according to various embodiments; and

FIGS. **9**A through **9**D depict a surgical technique using two flexible constructs according to various embodiments.

DETAILED DESCRIPTION

The following description is merely exemplary in nature and is not intended to limit the present disclosure, application, or uses. Although certain examples and surgical methods disclosed herein are in conjunction with a suture anchor, it is understood that the suture fixation device can be any device with which to hold a suture. While the present teachings are disclosed in connection with labral repairs, it is understood that the devices and surgical techniques can easily be adapted for other orthopedic and non-orthopedic uses.

Referring to FIGS. **1** through **3**B, the flexible construct **10** includes an adjustable loop **12**, a passage **14**, and an adjusting arm **16**. Reduction of the adjustable loop **12** compresses the tissue and provides fixation of the tissue. The adjustable loop **12** and the surgical methods detailed herein, eliminate the need to tie a knot and thereby increase surgical efficiency. As compared to traditional sutures secured by tying a knot, the flexible construct **10** of various embodiments provides increased load to failure, has multiple-fold increased strength, has a decreased stretch at failure, and has multiple-fold stiffness at failure.

Referring to FIG. **2**, the flexible construct **10** can be made from any biocompatible material that is flexible and can pass through and secure a tissue. Exemplary materials include, but are not limited to, non-resorbable polymers, such as

polyethylene or polyester, resorbable polymers, metals, and various combinations thereof. The materials can include those formed into a monofilament, multiple filaments, cables, and the like. In various embodiments, the flexible construct **10** is made of a hollow material to allow for the appropriate folding and tensioning thereon.

In various embodiments, the flexible construct **10** can be a suture **18**. The suture **18** used to form the construct is generally a hollow suture having a distal end **20** and proximal end **22**. The suture **18** can be formed as a braided or multiple-filament suture structure that is formed to define a substantially tubular hollow-shaped flexible construct **10**.

The suture **18** contains a first opening **24** located closer to the distal end **20** and the second opening **26** located closer to the proximal end **22**. In various embodiments, the first opening **24** and the second opening **26** can extend along a top surface of the suture **18** and are sized to accommodate passage of the distal end **20** of the suture therethrough. It is understood that the first opening **24** and the second opening **26** need not be formed by cutting the suture **18** or by removing any suture material. For example, the first opening **24** or the second opening **26** can be formed by passing the suture distal end **20** through the sidewall of the hollow tubular suture **18**.

The passage **14** is defined by the area between the first opening **24** and the second opening **26**. The passage **14** can be a short passage, can extend to the length of a fastener used therewith, or have a greater length, as further detailed later herein.

To provide the adjustable loop **12** and the adjusting arm **16**, the distal end **20** of the suture **18** is passed through the first opening **24**, into and through the passage **14**, and advanced out of the second opening **26**. The portion exiting from the second opening **26** provides the adjusting arm **16** and the folded end provides the adjustable loop **12**.

Other adjustable loops that are useful in the various embodiments detailed herein are disclosed in U.S. patent application Ser. No. 11/541,506 to Stone, filed Sep. 29, 2006, and assigned to Biomet Sports Medicine, Inc., which is hereby incorporated by reference.

Referring to FIGS. **3**A and **3**B, the adjusting arm **16** is engaged or pulled in direction A to cause movement of the adjustable loop **12**. As the adjustable loop **12** is reduced in size (or creating a smaller diameter loop **12**), the adjusting arm **16** lengthens as shown in FIG. **3**B, In various embodiments, the movement of the suture **18** is only in the direction of arrow A and movement is prevented in the opposite direction. This unidirectional movement is controlled by maintaining tension (by pulling, for example) on the flexible construct **10** to radially compress the passage **14** about the suture portion contained therein as further detailed later herein.

To facilitate the unidirectional movement, a restriction element **28** can be included near the proximal end **22**. The restriction element **28** controls movement of the adjustable loop **12** and the adjusting arm **16**. Moreover, the restriction element **28** can prevent displacement of the flexible construct **10** in minimally invasive procedures. As depicted, the restriction element **28** is a knot. It is understood that the restriction element **28** does not provide the tissue fixation, but it is the tissue compression provided by the reduction of the adjustable loop **12** about the tissue that provides the fixation. The restriction element **28** can include other devices used to retain a suture, such as a suture clip.

The flexible construct **10** can be attached to a fastener to create an assembly. As shown in FIGS. **4** and **5**, an asymmetric suture anchor **100** is used as the fastener. The asymmetric suture anchor **100** is similar to anchors described in U.S. patent application Ser. No. 11/386,068 to Stone et al., filed Mar. 21, 2006, and assigned to Biomet Sports Medicine, Inc., which is hereby incorporated by reference.

The asymmetric suture anchor **100** includes a tip **102**, an anchor body **104** having an interior bore **106**, an exterior suture-receiving channel **108** defined by one side of the anchor body, and a port **110** connecting the interior bore **106** and the exterior suture-receiving channel **108**. The anchor can be made of any biocompatible material including, but not limited to, a metal, such as titanium, stainless steel, or alloys of cobalt, chromium, etc., or a polymer such as polyetheretherketone (PEEK) or polymers and copolymers of lactic and glycolic acid.

At the distal end of anchor **100**, the tip **102** is adapted to substantially ease entry of the asymmetric suture anchor **100** into the bone portion. The tip **102** can be generally smooth or rounded as shown in FIGS. **4** and **5**, or the tip **102** can be pointed as shown in FIGS. **6-9**D. The tip **102** guides the anchor **100** such that the anchor **100** can be placed into a pre-drilled hole in a honey tissue to reattach a soft tissue thereto without damaging the soft tissue. In various embodiments, the asymmetric suture anchor **100** can be rotated or twisted upon insertion into the pre-drilled hole to align and set the asymmetric suture anchor **100** prior to completely advancing the anchor **100** to its final position.

Attached to the tip **102** is the anchor body **104**. The anchor body **104** can be externally threaded or have helical or annular ribs. The threading can be a helical thread which starts at the meeting point of the tip **102** and the anchor body **104** as shown in threads **112**. The threads **112** facilitate engagement of the tissue by the asymmetric suture anchor **100**.

A bore **106** in the anchor body **104** extends from a proximal end of the anchor body **104** through an interior portion of the anchor body. The bore **106** generally extends along the longitudinal axis of the anchor body **104** and is open at the proximal end. The bore **106** can be offset with the outer diameter of the anchor body or the bore **106** can be concentric with the outer diameter of the anchor body. The bore **106** provides an area in which a region of the adjustable loop **12** can be placed in the interior of the anchor body **104**. The bore **106** is sufficiently sized to prevent passage of the restriction element **28** therethrough. Generally, the restriction element **28** is larger than the bore **106** and cannot fit therein.

As shown in FIG. **5**, the restriction element **28** can optionally be connected to the adjustable loop **12** to further secure the adjustable loop **12** in the anchor **100**. In such embodiments, the restriction element **28** can be attached to the adjusting arm **16**. The adjusting arm **16** can be sewn or knotted into the restriction element to create a bridge or passage across the proximal end of the anchor **100**. The adjusting arm **16** can also be passed through the adjustable loop **12** to interlace the adjusting arm **16** and the adjustable loop **12**. In either such embodiment, the adjustable loop is further secured to the anchor **100**.

The bore **106** is connected to a suture-receiving channel **108** with the port **110**. The suture-receiving channel **108** is located on an exterior surface of the anchor body **104**. The suture-receiving channel **108** provides an area in which a region of the adjustable loop **12** can optionally be placed on the exterior of the anchor body **104** without damaging the flexible construct **10**.

The port **110** connecting the suture-receiving channel **108** and the interior bore **106** is generally perpendicular to at

least one of the suture-receiving channel **108** and the interior bore **106**. The port **110** provides the communication between the inside of the anchor (interior bore **106**) and the outside of the anchor (suture-receiving channel **108**). The port **110** is sized to receive the adjustable loop **12**. As shown, the port **110** and the external suture-receiving channel **108** partially extend into the tip **102** and provide a break in the threading **112**. The port **110** can have the same diameter as the interior bore **106**. In various embodiments, the port **110** diameter, the interior bore **106** diameter, and the cross-section of the suture-receiving channel **108** are the same. The anchor **100** is stable and will not toggle when stress is placed on the anchor **100**.

The suture-receiving channel **108** and the bore **106** are considered to be offset or asymmetrical due to the adjustable loop **12** being partly received in the interior of the anchor body **104** at the bore **106** and partly received in the exterior of the anchor body **104** at the suture-receiving channel **108**. The combination and arrangement of the bore **106**, the suture-receiving channel **108**, and the port **110** form a continuous track or loop around which the adjustable loop **12** can be wrapped. In various embodiments, the passage **14** can be sized to be longer than the track or loop. This allows for radially compression or tensioning of the passage **14** using the anchor **100** and thereby prevents movement of the adjustable loop **12**.

The asymmetric suture anchor **100** can include a proximal end groove **114** to receive the suture and provides a surface upon which the restriction element **28** abuts. The proximal end groove **114** is in communication with the opening at the proximal end of the anchor body **104**.

The proximal end of the asymmetric suture anchor **100** also includes a driver-engaging region **116**, such as those detailed earlier herein. Particular to the asymmetric anchor, the proximal end groove **114** can be provided with a key **118**, depicted as inwardly curving shapes which will be axially received in the mating female driver.

Although the various embodiments detailed herein are used in connection with the asymmetric suture anchor **100**, it is understood that any other anchor or screw can be used in connection with the adjustable loop **12**. Suitable anchors can include an interior bore or opening in which to house the adjustable loop **12** and/or include features to protect the flexible construct **10**.

Referring to FIGS. **6** and **7**, the anchor **100** and the adjustable loop **12** combination is mated or connected to a driver **200**. The driver **200** includes a handle **202**, an adjusting arm receptacle **204**, an adjustable loop mount **206**, and an elongated, hollow shaft **208**.

The handle **202** is located at the driver first proximal end **210**. The handle **202** is partially hollow and is in communication with the shaft **208** at the shaft first proximal end **212** to facilitate passage of the adjusting arm **16** from the proximal end groove **114** of the anchor, down through the shaft **208**, and out of the adjusting arm receptacle **204** on the handle **202**. The handle **202** further includes the adjustable loop mount **206** to secure the adjustable loop **12** such that advancement of the driver **200** having the anchor **100** thereon through the cannula does not unintentionally move the adjustable loop **12**.

To connect the driver **200**, the anchor **100**, and the flexible construct **10**, the adjustable loop **12** is passed through the bore **106** of the anchor **100**. The restriction element **28** is arranged to contact the proximal end groove **114**. The adjusting arm **16** is extended through the hollow shaft **208**, passed through the handle **202**, and passed through the adjusting arm receptacle **204**. The anchor **100** is oriented in close proximity to a second distal end **214** of the shaft **208**. Next, the adjustable loop **12** is directed through the external suture-receiving channel **108** of the anchor **100** and out of the port **110**. The driver-engaging feature **118** of the anchor **100** is then connected to the mated feature on the shaft second distal end **214**. The adjustable loop **12** can be aligned adjacent to the exterior of the shaft **208** to extend the adjustable loop **12** to the adjustable loop mount **206**. In embodiments employing a restriction element **28**, the restriction element **28** can be sized to prevent passage of the restriction element through the shaft **208**.

Next, the adjustable loop **12** can be removably fixed or connected to the adjustable loop mount **206**. The adjustable loop mount **206** keeps the flexible construct **10** in proper alignment with the shaft **208** such that advancement of the driver **200** having the anchor **100** and flexible construct **10** thereon, through a cannula **216** does not unintentionally move the flexible construct **10**. Attaching the adjustable loop **12** to the adjustable loop mount **206** provides compression of the passage **14** and thereby restricts movement of the adjustable loop **12** in the direction opposite to arrow A of FIGS. **3**A and **3**B. When the adjustable loop **12** is disengaged from the adjustable loop mount **206**, moving the adjusting arm **16** causes a reduction in the size of the adjustable loop **12**. In various embodiments, the adjustable loop **12** need not be mounted to the adjustable loop mount **206**.

The tension can be maintained on the adjusting arm **16** by containing the adjusting arm **16** in the adjusting arm receptacle **204** or by other suitable means. As long as tension is maintained on the adjusting arm **16** (for example, via the adjusting arm receptacle **204**) and the adjustable loop **12** (for example, via the adjustable loop mount **206**), the flexible construct **10** will not move while on the driver.

In various embodiments, the flexible construct **10** is used to fix a defect where there is a need to fix a soft tissue or implant to a bone. The flexible construct **10** and surgical techniques detailed herein can be used with various repairs of the shoulder, wrist, hand, ankle, foot, elbow, knee, or hip as non-limiting examples. Exemplary repairs include Bankart Repair, SLAP Repair, Acromioclavicular separation, rotator cuff repair, capsule repair or capsulolabral reconstruction, biceps tenodesis, or deltoid repair of the shoulder; scapholunate ligament reconstruction or ulnar radial collateral ligament reconstruction of the wrist or hand; lateral stabilization, medial stabilization, Achilles tendon repair and reconstruction, halux valgus reconstruction, midfoot reconstruction, and forefoot reconstruction of the ankle or foot; lateral epicondylitis (tennis elbow) repair, ulnar or radial collateral ligament reconstruction, and biceps tendon reconstruction of the elbow; and extra-capsular repair, medial collateral ligament repair, lateral collateral ligament repair, posterior oblique ligament repair, joint capsule closure, iliotibial band tenodesis reconstruction, patellar realignment and repair, patellar ligament and tendon repair, and vastus medialis obliquus muscle advancement.

Referring to FIGS. **8**A through **8**D, methods of repairing a soft tissue defect, such as a cartilage defect are provided. The adjustable loop **12** is offset in the bore **106** of the asymmetric suture anchor **100** and affixed to the driver **200** as detailed above. The adjustable loop **12** is released from the adjustable loop mount **206**, if used, and the assembly is placed in the cannula **216** at the defect site **300**.

The adjustable loop **12** is then passed through the cartilage **302** as shown in FIG. **8**B. The adjustable loop **12** can be passed through the cartilage **302** by piercing a hole in the cartilage prior to passing the suture therethrough. This can

be performed with a separate needle, a needle that is removably attached to the adjustable suture loop **12** or, depending on the fastener used, with a tip of the fastener. Any suitable suture passer or other device can also be used to pass the adjustable loop **12** through the cartilage **302** such as those known in the art as "bird beak" passers or suture lariats. Two devices useful for passing the suture include those sold under the tradenames SpeedPass and ArthroPass, both made by Biomet Sports Medicine, Inc. of Warsaw, Ind. A front portion **30** of the adjustable loop is passed through and protrudes from the cartilage **302**.

The front portion **30** is lengthened (or further pulled through the cartilage **302**) to provide an area in which to fold the adjustable loop **12** upon itself. The front portion **30** is wrapped around the anchor **100** to form an S-shape which spans between the tissue and the anchor **100**. The anchor **100** is then passed back through the adjustable loop **12** as shown in FIG. **8**C. This wrapping or doubling of the adjustable loop **12** provides a region in which the tissue is compressed.

The anchor **100** is then placed in a pre-drilled hole **304** in an adjacent bone **306** as shown in FIG. **8**D. The threads **112** secure the anchor **100** in the bone hole **304**. The driver **200** can be removed once the anchor **100** is secured in the bone **306**. This can be performed prior to or after the suture is tightened down against the tissue.

Next, the adjusting arm **16** is engaged to reduce the size of the adjustable loop **12**. The restriction element **28** keeps the adjustable loop **12** in place on the anchor **100** and prevents retreat of the adjustable loop **12** through the shaft **208**. When the adjusting arm **16** is advanced sufficiently far to provide the appropriate compression to the cartilage **302** and fix the cartilage **302** at the defect site **300**, the ends of the adjusting arm **16** can be removed as shown in FIG. **8**E.

At least a portion of the proximal end of the anchor **100** is in very close proximity to the cartilage **302** or abuts the cartilage **302**, thereby enhancing the fixation of the cartilage **302** to the bone **306**. In various embodiments, the suture-receiving channel **108** of the anchor can abut the cartilage **302** to minimize the length of suture **18** that remains between the beginning of the available or suturable suture in the bone hole **304** and the cartilage **302** or the other tissue to be secured. When the offset or channel **108** area of the anchor body **104** abuts the defect site **300**, the repair is stronger due to the ability to more tightly secure the tissue to the underlying bone **306** and the ability to minimize the gap or lag between the anchor body **104** and the tissue.

Such embodiments where the proximity between the tissue and the anchor **100** is optimized are particularly useful in repairing certain soft tissue defects, for example, a labral tear. The anchor body proximal end would abut the labrum and provide strong attachment and promote healing of the labral tear and restore strength to the shoulder or the hip, for example.

The above-mentioned repair techniques can be used for any orthopedic repair including cartilage repair, ligament repair, or tendon repair, or any other orthopedic repair. The repair can be with an articular orthopedic surface or a non-articular and/or non-orthopedic surface.

Referring to FIGS. **9**A through **9**D, the present teachings also provide surgical methods where multiple flexible constructs **10** and **10'** are incorporated with multiple suture anchors **100** and **100'**. To start, a first anchor **100** is inserted as described above herein. Prior to removing the first shaft **208** of the first driver **200**, the second loop **12'** is passed over the first shaft **208** as shown in FIG. **9**A. Next, the first shaft **208** and the first driver **200** are then removed from the defect site **300**. The second anchor **100'** is then passed through the first loop **12** again to interlace the adjustable loops **12** and **12'** as shown in FIG. **9**B.

The second anchor **100'** is then secured through the tissue **302** and into the bone **306**. The first adjusting arm **16** and the second adjusting arm **16'** are then engaged to cause the respective loops to reduce in size and form a link or bridge **400** of interlaced adjustable loops **12** and **12'** between the first anchor **100** and the second anchor **100'**. After the adjusting arms **16** and **16'** are engaged to the correct distance to reduce the respective adjustable loops and provide the appropriate amount of tissue compression and securing at the defect site **300**, the adjusting arms **16** and **16'** can be optionally cut. There is no need for the surgeon to tie a knot as the interlaced and compressed loops provide the tissue fixation.

These surgical methods can be expanded to include a plurality of adjustable loops and a plurality of suture anchors. In such embodiments, the anchors are inserted in succession as detailed above. Each subsequent anchor is then wrapped through the adjustable loop of any prior anchor and then inserted into the tissue. The respective adjusting arms are then engaged advanced to create a larger interlaced bridge system.

The description of the present teachings is merely exemplary in nature and, thus, variations that do not depart from the gist of the present teachings are intended to be within the scope of the present teachings. Such variations are not to be regarded as a departure from the spirit and scope of the present teachings.

What is claimed is:

1. A suture anchor assembly, comprising:

an anchor for insertion into a hole in a bone, the anchor having a longitudinal axis that extends between a proximal end and a distal end of the anchor, the anchor including a first opening in the proximal end of the anchor which leads to a longitudinal interior bore in the anchor, the anchor further including a second opening in a side wall of the anchor which leads to a transverse passage in the anchor, the transverse passage proximate the distal end of the anchor and connecting the longitudinal interior bore in the anchor to a longitudinal exterior channel in the anchor that extends along an outer surface of the anchor; and

an adjustable suture construct that includes a suture with a first free end that passes through a first longitudinal passage in the suture to form a first adjustable loop, wherein the adjustable suture construct is coupled to the anchor such that the first longitudinal passage in the suture: (i) extends along the longitudinal interior bore; (ii) passes through the transverse passage; (iii) exits the anchor through the second opening in the side wall of the anchor; and (iv) extends along the outer surface of the anchor in the longitudinal exterior channel in the anchor,

wherein the first longitudinal passage in the suture protrudes from the second opening in the side wall of the anchor such that the first adjustable loop extends away from the second opening.

2. The suture anchor assembly of claim **1**, wherein the first longitudinal passage in the suture extends along the entirety of the longitudinal interior bore in the anchor.

3. The suture anchor assembly of claim **1** further comprising a driver carrying the anchor.

4. The suture anchor assembly of claim **3**, wherein the driver includes an adjustable loop mount to which the first adjustable loop is removeably fixed.

5. The suture anchor assembly of claim 4, wherein the first adjustable loop being removeably fixed to the adjustable loop mount includes a portion of the first adjustable loop being positioned around the adjustable loop mount.

6. The suture anchor assembly of claim 1, wherein the entirety of the first adjustable loop is positioned outside the anchor.

7. The suture anchor assembly of claim 1, wherein at least part of the first adjustable loop is positioned along the outer surface of the anchor in the longitudinal exterior channel in the anchor.

8. The suture anchor assembly of claim 1, wherein the first free end of the suture extends away from the first opening in the proximal end of the anchor.

9. A suture anchor assembly, comprising:

an anchor for insertion into a hole in a bone, the anchor having a longitudinal axis that extends between a proximal end and a distal end of the anchor, the anchor including a first opening in the proximal end of the anchor which leads to a longitudinal interior bore in the anchor, the anchor further including a second opening in a side wall of the anchor which leads to a transverse passage in the anchor, the transverse passage proximate the distal end of the anchor and connecting the longitudinal interior bore in the anchor to a longitudinal exterior channel in the anchor that extends along an outer surface of the anchor; and

an adjustable suture construct coupled to the anchor, the adjustable suture construct including a suture with a first free end that passes through a first longitudinal passage in the suture to form a first adjustable loop,

wherein the adjustable suture construct being coupled to the anchor includes the adjustable suture construct extending through the longitudinal interior bore in the anchor with the first adjustable loop extending away from the second opening in the side wall of the anchor and with the first free end of the suture extending away from the first opening in the proximal end of the anchor such that the first free end can be pulled to a reduce a size of the first adjustable loop,

wherein the first longitudinal passage in the suture protrudes from the second opening in the side wall of the anchor with at least part of the first adjustable loop being positioned along the outer surface of the anchor in the longitudinal exterior channel in the anchor.

10. The suture anchor assembly of claim 9, wherein the entirety of the first adjustable loop is positioned outside the anchor.

11. The suture anchor assembly of claim 9, wherein the first longitudinal passage in the suture extends along the entirety of the longitudinal interior bore in the anchor.

12. The suture anchor assembly of claim 11, wherein the first longitudinal passage in the suture: (i) extends along the longitudinal interior bore; (ii) passes through the transverse passage; (iii) exits the anchor through the second opening in the side wall of the anchor; and (iv) extends along the outer surface of the anchor in the longitudinal exterior channel in the anchor.

13. The suture anchor assembly of claim 9 further comprising a driver carrying the anchor.

14. The suture anchor assembly of claim 13, wherein the driver includes an adjustable loop mount to which the first adjustable loop is removeably fixed.

* * * * *